

Patent  
Customer No.: 006980  
Docket No. NASA1

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re application of: )  
NARUKE, M. )  
For: EXHAUST GAS PURIFIER )

**PRELIMINARY AMENDMENT**

Box: Patent Application  
Commissioner for Patents  
Washington, D.C. 20231

Atlanta, Georgia 30308-2216

Sir:

Prior to examining the above-identified application, please make the following amendments:

**IN THE SPECIFICATION**

Please amend the Specification as follows: (*a marked-up set of amended paragraphs is attached hereto as Appendix A*)

*Page 1, line 1*, delete the paragraph - SPECIFICATION.

*Page 1, before line 5*, insert the following paragraphs -

**CROSS-REFERENCE TO RELATED APPLICATIONS AND CLAIM OF PRIORITY**

This is a U.S. National Phase application of PCT/JP00/06490 filed on 22 September 2000, which PCT application claims priority on JP application number 11-270885, filed 24 September 1999 and JP application number 2000-200799, filed 02 July 2000.

**FIELD OF THE INVENTION**

*Page 1, line 11*, delete the paragraph - Background Technology - and insert the following paragraph -

**BACKGROUND OF THE INVENTION**

*Page 4, line 19 - Page 9, line 9*, delete all the paragraphs, and insert therefore:

**SUMMARY OF THE INVENTION**

A first aspect of the present invention relates to an exhaust gas purifier comprising: an exhaust gas purifying tank accommodating, at an interior, an exhaust gas purifying liquid

selected from lubricating oils and animal and vegetable oils; an exhaust gas introducing flow path provided at a bottom portion of the exhaust gas purifying tank, and introducing exhaust gas which is to be purified into the exhaust gas purifying liquid accommodated in the exhaust gas purifying tank; and an exhaust gas guide-out flow path which guides exhaust gas, which has flowed through the exhaust gas purifying liquid, out to an exterior of the exhaust gas purifying tank, wherein a floating sphere filter which is equipped with floating spheres, which are a group of spheres, and a floating sphere accommodating chamber, which accommodates the floating spheres at an interior and which has a bottom plate and a ceiling plate formed such that the exhaust gas can flow therethrough and whose side walls are formed by floating walls which are thrust so as to push the floating spheres to return toward a central portion, is provided at the exhaust gas guide-out flow path.

A second aspect of the present invention relates to an exhaust gas purifier comprising: a first exhaust gas purifying tank accommodating, at an interior, an exhaust gas purifying liquid selected from lubricating oils and animal and vegetable oils; a second exhaust gas purifying tank accommodating, at an interior, a nitrogen oxide removing liquid which has affinity with respect to nitrogen oxides and sulfur oxides; a first exhaust gas introducing flow path provided at a bottom portion of the first exhaust gas purifying tank, and introducing exhaust gas which is to be purified into the exhaust gas purifying liquid accommodated in the first exhaust gas purifying tank; a second exhaust gas introducing flow path provided at a bottom portion of the second exhaust gas purifying tank, and introducing exhaust gas, which has been guided-out from the first exhaust gas purifying tank, into the nitrogen oxide removing liquid accommodated in the second exhaust gas purifying tank; and an exhaust gas guide-out flow path which guides exhaust gas, which has been introduced into the exhaust gas purifying liquid, out to an exterior of the second exhaust gas purifying tank, wherein a floating sphere filter which is equipped with floating spheres, which are a group of spheres, and a floating sphere accommodating chamber, which accommodates the floating spheres at an interior and which has a bottom plate and a ceiling plate formed such that the exhaust gas can flow therethrough and whose side walls are formed by floating walls which are thrust so as to push the floating spheres to return toward a central portion, is provided at both of the second exhaust gas introducing flow path and the exhaust gas guide-out flow path.

A third aspect of the present invention relates to, in the exhaust gas purifier relating to the above-described second aspect, an exhaust gas purifier in which the nitrogen oxide removing liquid is water.

A fourth aspect of the present invention relates to an exhaust gas purifier having an exhaust gas purifying tank accommodating, at an interior, an exhaust gas purifying liquid selected from lubricating oils and animal and vegetable oils; an exhaust gas introducing means provided within the exhaust gas purifying tank, and introducing exhaust gas into the exhaust gas purifying liquid accommodated in the exhaust gas purifying tank; and an exhaust gas guide-out flow path which guides out exhaust gas which has flowed through the exhaust gas purifying liquid, wherein the exhaust gas introducing means is equipped with: an exhaust gas jetting portion which jets exhaust gas in a given direction; and an exhaust gas flow guiding duct which extends along a direction of jetting exhaust gas at the exhaust gas jetting portion, and a purifying liquid return opening, through which the exhaust gas purifying liquid flows in, is provided at one end of the exhaust gas flow guiding duct, and an opening portion, through which exhaust gas purifying liquid which has flowed through an interior flows out, is provided at another end of the exhaust gas flow guiding duct, and the exhaust gas jetting portion is accommodated in a vicinity of the purifying liquid return opening, and a floating sphere filter which is equipped with floating spheres, which are a group of spheres, and a floating sphere accommodating chamber, which accommodates the floating spheres at an interior and which has a bottom plate and a ceiling plate formed such that the exhaust gas can flow therethrough and whose side walls are formed by floating walls which are thrust so as to push the floating spheres to return toward a central portion, is provided at the exhaust gas guide-out flow path.

A fifth aspect of the present invention relates to an exhaust gas purifier having an exhaust gas purifying tank accommodating, at an interior, an exhaust gas purifying liquid selected from lubricating oils and animal and vegetable oils; an exhaust gas introducing means provided within the exhaust gas purifying tank, and introducing exhaust gas into the exhaust gas purifying liquid accommodated in the exhaust gas purifying tank; and an exhaust gas guide-out flow path which guides out exhaust gas which has flowed through the exhaust gas purifying liquid, wherein the exhaust gas introducing means is equipped with: an exhaust gas jetting portion which jets exhaust gas in a given direction; and an exhaust gas flow guiding duct which extends along a direction of jetting exhaust gas at the exhaust gas jetting portion, and a purifying liquid return opening, through which the exhaust gas purifying liquid flows in, is provided at one end of the exhaust gas flow guiding duct, and an opening portion, through which exhaust gas purifying liquid which has flowed through an interior flows out, is provided at another end of the exhaust gas flow guiding duct, and the exhaust gas jetting

portion is accommodated in a vicinity of the purifying liquid return opening, and an exhaust gas purifying liquid agitating portion, which is equipped with an agitating sphere accommodating chamber, which is formed such that exhaust gas can flow therethrough, and agitating spheres, which are accommodated floatably at an interior of the agitating sphere accommodating chamber, and which agitates exhaust gas purifying liquid flowing out from an interior of the exhaust gas flow guiding duct, is provided in the vicinity of the opening portion provided at the other end of the exhaust gas flow guiding duct.

A sixth aspect of the present invention relates to, in the exhaust gas purifier relating to the above-described fifth aspect, an exhaust gas purifier in which a floating sphere filter which is equipped with floating spheres, which are a group of spheres, and a floating sphere accommodating chamber, which accommodates the floating spheres at an interior and which has a bottom plate and a ceiling plate formed such that the exhaust gas can flow therethrough and whose side walls are formed by floating walls which are thrust so as to push the floating spheres to return toward a central portion, is provided at the exhaust gas guide-out flow path.

A seventh aspect of the present invention relates to, in the exhaust gas purifier relating to any one of the above-described fourth through sixth aspects, an exhaust gas purifier in which the exhaust gas jetting portion is formed so as to jet the exhaust gas upwardly and obliquely upwardly.

An eighth aspect of the present invention relates to, in the exhaust gas purifier relating to any one of the above-described fifth through seventh aspects, an exhaust gas purifier in which the agitating sphere accommodating chamber is a agitating sphere rotating container which is formed so as to be able to rotate around an axis which extends in a horizontal direction.

A ninth aspect of the present invention relates to, in the exhaust gas purifier relating to any one of the first through eighth aspects, an exhaust gas purifier in which the exhaust gas purifying liquid is a lubricating oil.

A tenth aspect of the present invention relates to, in the exhaust gas purifier relating to the ninth aspect, an exhaust gas purifier in which the lubricating oil has a viscosity of 5 to 2,000 cSt.

Other examples of the floating spheres 14 are soft-material-covered spheres in which the surface of the above metal sphere is covered by a soft material such as rubber, a thermoplastic elastomer, or a soft resin, e.g., soft vinyl chloride resin or the like, and ceramic spheres and the like.

Here, the exhaust gas purifier shown in Fig. 1 is usually used in a state of being loaded in a large-sized automobile such as a truck or the like. Thus, during use thereof, the exhaust gas purifier always receives vibrations from the road surface.

Accordingly, the exhaust gas purifying tank 2 also receives horizontal direction acceleration. Further, the floating sphere filter 16 and the floating spheres 14 accommodated in the floating sphere filter 16 also receive horizontal direction acceleration.

The floating spheres 14 which receive the horizontal direction acceleration push the floating wall 12D, which is at the side to which the acceleration is applied, toward the side wall 12E at the facing side which, together with that floating wall 12D, sandwiches the springs 12F. In this way, these springs 12F contract in the direction of the acceleration. Thus, due to the thrusting force from these springs 12F, that floating wall 12D moves toward the central portion of the floating sphere accommodating chamber 12, and the floating spheres 14 as well are

Page 72, before line 1, delete the paragraph - Claims - and insert the following paragraph -

I Claim:



a second exhaust gas introducing flow path provided at a bottom portion of the second exhaust gas purifying tank, and introducing exhaust gas, which has been guided-out from the first exhaust gas purifying tank, into the nitrogen oxide removing liquid accommodated in the second exhaust gas purifying tank; and

an exhaust gas guide-out flow path which guides exhaust gas, which has been introduced into the exhaust gas purifying liquid, out to an exterior of the second exhaust gas purifying tank,

wherein a floating sphere filter which is equipped with floating spheres, which are a group of spheres, and a floating sphere accommodating chamber, which accommodates the floating spheres at an interior and which has a bottom plate and a ceiling plate formed such that the exhaust gas can flow therethrough and whose side walls are formed by floating walls which are thrust so as to push the floating spheres to return toward a central portion, is provided at both of the second exhaust gas introducing flow path and the exhaust gas guide-out flow path.

3. An exhaust gas purifier according to claim 2, wherein the nitrogen oxide removing liquid is water.

4. An exhaust gas purifier having an exhaust gas purifying tank accommodating, at an interior, an exhaust gas purifying liquid selected from lubricating oils and animal and vegetable oils; an exhaust gas introducing means provided within the exhaust gas purifying tank, and introducing exhaust gas into the exhaust gas purifying liquid accommodated in the exhaust gas purifying tank; and an exhaust gas guide-out flow path which guides out exhaust gas which has flowed through the exhaust gas purifying liquid,

wherein the exhaust gas introducing means is equipped with:

an exhaust gas jetting portion which jets exhaust gas in a given direction; and

an exhaust gas flow guiding duct which extends along a direction of jetting exhaust gas at the exhaust gas jetting portion, and a purifying liquid return opening, through which the exhaust gas purifying liquid flows in, is provided at one end of the exhaust gas flow guiding duct, and an opening portion, through which exhaust gas purifying liquid which has flowed through an interior flows out, is provided at another end of the exhaust gas flow guiding duct, and the exhaust gas jetting portion is accommodated in a vicinity of the purifying liquid return opening, and

a floating sphere filter which is equipped with floating spheres, which are a group of spheres, and a floating sphere accommodating chamber, which accommodates the

floating spheres at an interior and which has a bottom plate and a ceiling plate formed such that the exhaust gas can flow therethrough and whose side walls are formed by floating walls which are thrust so as to push the floating spheres to return toward a central portion, is provided at the exhaust gas guide-out flow path.

5. An exhaust gas purifier having an exhaust gas purifying tank accommodating, at an interior, an exhaust gas purifying liquid selected from lubricating oils and animal and vegetable oils; an exhaust gas introducing means provided within the exhaust gas purifying tank, and introducing exhaust gas into the exhaust gas purifying liquid accommodated in the exhaust gas purifying tank; and an exhaust gas guide-out flow path which guides out exhaust gas which has flowed through the exhaust gas purifying liquid,

wherein the exhaust gas introducing means is equipped with:

an exhaust gas jetting portion which jets exhaust gas in a given direction; and

an exhaust gas flow guiding duct which extends along a direction of jetting exhaust gas at the exhaust gas jetting portion, and a purifying liquid return opening, through which the exhaust gas purifying liquid flows in, is provided at one end of the exhaust gas flow guiding duct, and an opening portion, through which exhaust gas purifying liquid which has flowed through an interior flows out, is provided at another end of the exhaust gas flow guiding duct, and the exhaust gas jetting portion is accommodated in a vicinity of the purifying liquid return opening, and

an exhaust gas purifying liquid agitating portion, which is equipped with a agitating sphere accommodating chamber, which is formed such that exhaust gas can flow therethrough, and agitating spheres, which are accommodated so as to be able to floating at an interior of the agitating sphere accommodating chamber, and which mixes exhaust gas purifying liquid which flows out from an interior of the exhaust gas flow guiding duct, is provided in a vicinity of the opening portion provided at the other end of the exhaust gas flow guiding duct.

6. An exhaust gas purifier according to claim 5, wherein a floating sphere filter which is equipped with floating spheres, which are a group of spheres, and a floating sphere accommodating chamber, which accommodates the floating spheres at an interior and which has a bottom plate and a ceiling plate formed such that the exhaust gas can flow therethrough and whose side walls are formed by floating walls which are thrust so as to push the floating spheres to return toward a central portion, is provided at the exhaust gas guide-out flow path.







oils; a second exhaust gas purifying tank accommodating, at an interior, a nitrogen oxide removing liquid which has affinity with respect to nitrogen oxides and sulfur oxides; a first exhaust gas introducing flow path provided at a bottom portion of the first exhaust gas purifying tank, and introducing exhaust gas which is to be purified into the exhaust gas purifying liquid accommodated in the first exhaust gas purifying tank; a second exhaust gas introducing flow path provided at a bottom portion of the second exhaust gas purifying tank, and introducing exhaust gas, which has been guided-out from the first exhaust gas purifying tank, into the nitrogen oxide removing liquid accommodated in the second exhaust gas purifying tank; and an exhaust gas guide-out flow path which guides exhaust gas, which has been introduced into the exhaust gas purifying liquid, out to an exterior of the second exhaust gas purifying tank, wherein a floating sphere filter which is equipped with floating spheres, which are a group of spheres, and a floating sphere accommodating chamber, which accommodates the floating spheres at an interior and which has a bottom plate and a ceiling plate formed such that the exhaust gas can flow therethrough and whose side walls are formed by floating walls which are thrust so as to push the floating spheres to return toward a central portion, is provided at both of the second exhaust gas introducing flow path and the exhaust gas guide-out flow path.

A third aspect of the present invention relates to, in the exhaust gas purifier relating to the above-described second aspect, an exhaust gas purifier in which the nitrogen oxide removing liquid is water.

A fourth aspect of the present invention relates to an exhaust gas purifier having an exhaust gas purifying tank accommodating, at an interior, an exhaust gas purifying liquid selected from lubricating oils and animal and vegetable oils; an exhaust gas introducing means provided within the exhaust gas purifying tank, and introducing exhaust gas into the exhaust gas purifying liquid accommodated in the exhaust gas purifying tank; and an exhaust gas guide-out flow path which guides out exhaust gas which has flowed through the exhaust gas purifying liquid, wherein the exhaust gas introducing means is equipped with: an exhaust gas jetting portion which jets exhaust gas in a given direction; and an exhaust gas flow guiding duct which extends along a direction of jetting exhaust gas at the exhaust gas jetting portion, and a purifying liquid return opening, through which the exhaust gas purifying liquid flows in, is provided at one end of the exhaust gas flow guiding duct, and an opening portion, through which

exhaust gas purifying liquid which has flowed through an interior flows out, is provided at another end of the exhaust gas flow guiding duct, and the exhaust gas jetting portion is accommodated in a vicinity of the purifying liquid return opening, and a floating sphere filter which is equipped with floating spheres, which are a group of spheres, and a floating sphere accommodating chamber, which accommodates the floating spheres at an interior and which has a bottom plate and a ceiling plate formed such that the exhaust gas can flow therethrough and whose side walls are formed by floating walls which are thrust so as to push the floating spheres to return toward a central portion, is provided at the exhaust gas guide-out flow path.

A fifth aspect of the present invention relates to an exhaust gas purifier having an exhaust gas purifying tank accommodating, at an interior, an exhaust gas purifying liquid selected from lubricating oils and animal and vegetable oils; an exhaust gas introducing means provided within the exhaust gas purifying tank, and introducing exhaust gas into the exhaust gas purifying liquid accommodated in the exhaust gas purifying tank; and an exhaust gas guide-out flow path which guides out exhaust gas which has flowed through the exhaust gas purifying liquid, wherein the exhaust gas introducing means is equipped with: an exhaust gas jetting portion which jets exhaust gas in a given direction; and an exhaust gas flow guiding duct which extends along a direction of jetting exhaust gas at the exhaust gas jetting portion, and a purifying liquid return opening, through which the exhaust gas purifying liquid flows in, is provided at one end of the exhaust gas flow guiding duct, and an opening portion, through which exhaust gas purifying liquid which has flowed through an interior flows out, is provided at another end of the exhaust gas flow guiding duct, and the exhaust gas jetting portion is accommodated in a vicinity of the purifying liquid return opening, and an exhaust gas purifying liquid agitating portion, which is equipped with an agitating sphere accommodating chamber, which is formed such that exhaust gas can flow therethrough, and agitating spheres, which are accommodated floatably at an interior of the agitating sphere accommodating chamber, and which agitates exhaust gas purifying liquid flowing out from an interior of the exhaust gas flow guiding duct, is provided in the vicinity of the opening portion provided at the other end of the exhaust gas flow guiding duct.

A sixth aspect of the present invention relates to, in the exhaust gas purifier relating to the above-described fifth aspect, an exhaust gas purifier in which a floating





## APPENDIX B

[An object of t]The present invention is [to provide] an exhaust gas purifier [which] that can effectively remove soot from exhaust gas of a diesel automobile [such as], for example, a truck and a bus [and the like, and which]. The present invention has a simple structure, and can effectively remove from [an] exhaust gas [purifier in which] the following exemplary pollutants, carbon monoxide, nitrogen oxides, [and] sulfur oxides and [the like can, in addition to] hydrocarbons.], be effectively removed from exhaust gas.

The exhaust gas purifier of the present invention is equipped with an exhaust gas purifying tank accommodating, at an interior, an exhaust gas purifying liquid selected from lubricating oils and animal and vegetable oils; an exhaust gas introducing flow path provided at a bottom portion of the exhaust gas purifying tank, and introducing exhaust gas which is to be purified into the exhaust gas purifying liquid accommodated in the exhaust gas purifying tank; and an exhaust gas guide-out flow path which guides exhaust gas, which has flowed through the exhaust gas purifying liquid, out to an exterior of the exhaust gas purifying tank.

The present invention further encompasses an exhaust gas purifier equipped with, in addition to a first exhaust gas purifying tank which is similar to the above-described exhaust gas purifying tank, a second exhaust gas purifying tank which accommodates, in an interior, a nitrogen oxide removing liquid such as water or an alkaline solution or the like.]







a floating sphere filter which is equipped with floating spheres, which are a group of spheres, and a floating sphere accommodating chamber, which accommodates the floating spheres at an interior and which has a bottom plate and a ceiling plate formed such that the exhaust gas can flow therethrough and whose side walls are formed by floating walls which are thrust so as to push the floating spheres to return toward a central portion, is provided at the exhaust gas guide-out flow path.

5. (amended) An exhaust gas purifier [according to claim 2, wherein the second exhaust gas purifying tank is equipped with a nitrogen oxide removing liquid discharge preventing means which prevents the nitrogen oxide removing liquid stored in the second exhaust gas purifying tank from being discharged out to an exterior of the second exhaust gas purifying tank concomitantly with exhaust gas which has flowed through the nitrogen oxide removing liquid] having an exhaust gas purifying tank accommodating, at an interior, an exhaust gas purifying liquid selected from lubricating oils and animal and vegetable oils; an exhaust gas introducing means provided within the exhaust gas purifying tank, and introducing exhaust gas into the exhaust gas purifying liquid accommodated in the exhaust gas purifying tank; and an exhaust gas guide-out flow path which guides out exhaust gas which has flowed through the exhaust gas purifying liquid,

wherein the exhaust gas introducing means is equipped with:

an exhaust gas jetting portion which jets exhaust gas in a given direction;

and

an exhaust gas flow guiding duct which extends along a direction of jetting exhaust gas at the exhaust gas jetting portion, and a purifying liquid return opening, through which the exhaust gas purifying liquid flows in, is provided at one end of the exhaust gas flow guiding duct, and an opening portion, through which exhaust gas purifying liquid which has flowed through an interior flows out, is provided at another end of the exhaust gas flow guiding duct, and the exhaust gas jetting portion is accommodated in a vicinity of the purifying liquid return opening, and

an exhaust gas purifying liquid agitating portion, which is equipped with a agitating sphere accommodating chamber, which is formed such that exhaust gas can flow therethrough, and agitating spheres, which are accommodated so as to be able to floating at an interior of the agitating sphere accommodating chamber, and which mixes exhaust gas purifying liquid which flows out from an interior of the exhaust gas flow



wherein the exhaust gas introducing means is equipped with:

an exhaust gas jetting portion which jets exhaust gas in a given direction;

and

an exhaust gas flow guiding duct which extends along a direction of jetting exhaust gas at the exhaust gas jetting portion, and an opening portion, through which the exhaust gas purifying liquid flows in, is provided at one end of the exhaust gas flow guiding duct, and an opening portion, through which exhaust gas purifying liquid which has flowed through an interior flows out, is provided at another end of the exhaust gas flow guiding duct, and the exhaust gas jetting portion is accommodated in the vicinity of the opening portion provided at the one end] according to any one of claims 5 through 6, wherein the agitating sphere accommodating chamber is a agitating sphere rotating container which is formed so as to be able to rotate around an axis which extends in a horizontal direction.

9. (amended) An exhaust gas purifier according to [claim 8, wherein an exhaust gas purifying liquid agitating portion, which mixes exhaust gas purifying liquid which flows out from an interior of the exhaust gas flow guiding duct, is formed in the vicinity of the opening portion provided at the other end of the exhaust gas flow guiding duct] any one of claims 1 through 6, wherein the exhaust gas purifying liquid is a lubricating oil.

10. (amended) An exhaust gas purifier according to claim [8 or] 9, wherein [the exhaust gas jetting portion is formed so as to jet the exhaust gas upwardly or obliquely upwardly] the lubricating oil has a viscosity of 5 to 2,000 cSt.